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TWO UNITS IN GENERAL MATHEMATICS

Submitted by

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(B.S., Boston University, 1932)

In partial fulfillment of requirements

for the degree of Master of Education

1946

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CHAPTER I

SCOPE OF THE THESIS

Each year in Lyman Hall High School, a half year of general mathematics is required of all Seniors who do not elect solid geometry, trigonometry or office practice. It is primarily set up as a fundamental-refresher course in arithmetic and first year algebra, although all required work may be done in arithmetic.

Due to the manner in which the enrolees are selected, it naturally follows that the class membership is heterogeneous and represents a cross section of the entire school from the standpoint of curriculums, intelligence quotients and factual background.

More specifically the group this semester ranges from a low intelligence quotient[1/] of eighty-two to a high quotient of one hundred and thirty-four; from those who have already had three years of mathematics[2/] in high school to those who have had no mathematics at all in high school; from those who have a grade placement of sixteen

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1/ Table I, Page 4

2/ Table II, Page 5

in mathematics,[1] based on a standard-mathematics test,[2] to those who have a grade placement of seven on the same test; and by curriculums[3] - eight from the college preparatory - four from the teaching preparatory - ten from the nursing preparatory - three from the commercial - twelve from the industrial arts - and nine from the general arts.

It is my problem to construct two units in this general mathematics course on the twelfth-grade level, one for multiplication and one for division, which will be broad and elastic enough to provide for the individual differences as indicated in the previous paragraph.

The principles followed in organizing these two units are those advocated by Professor Roy O. Billett of Boston University,[4] and the information reported in the units is based on a progressive-diagnostic-standard test - form B.[5]

This standard test was given before the units were organized, and from the analysis of the errors[6] revealed

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1/ Table III, Page 6

2/ Ernest W. Teigs and Willis W. Clark, Progressive Achievement Test - Form B. California Test Bureau. Los Angeles, California, 1943.

3/ Table II, Page 5

4/ Roy O. Billett, Fundamentals of Secondary School Teaching. Houghton Mifflin Company. Boston, 1940.

5/ Ibid, Page 2

6/ Table IV, Page 7

by the test, corrective work was planned and assigned the students. At the end of three weeks, the same standard test was given again over multiplication only; and at the end of another three weeks, the same standard test was given again over division only.

By analyzing the results shown on the same test taken before and after the units were engaged upon, and comparing these analyses one with the other, I was able to see how effective the units had been in giving the students proper activities to overcome their mathematical deficiencies shown on the first test.

This is just a beginning, but from this humble start I hope to improve my units each year so that I may be of greater assistance to the students in this phase of their education.

Table 1. Description of How Pupils are Grouped by Mathematics Courses Previously Completed in High School.

Intelligence-Quotient Groups	Number of Years of Secondary-School Mathematics Previously Completed			
	one	two	three	none
(1)	(2)	(3)	(4)	(5)
130 or higher I		2	1	
110-129 II	2	9	3	3
90-109 III	10	4	1	6
70-89 IV		3		2
Total	12	18	5	11

Table II. Description of How Pupils are Grouped by Curriculums

Intelligence-Quotient Groups	Curriculums					
	College Preparatory	Teaching Preparatory	Nursing Preparatory	Commercial	Industrial Arts	General Arts
(1)	(2)	(3)	(4)	(5)	(6)	(7)
130 and Above I	1	1	1			
110-129 II	3	2	5		4	3
90-109 III	4		4	3	6	4
70-89 IV		1			2	2
Total	8	4	10	3	12	9

Table III. Description of How Pupils are Grouped by Grade-Placement Levels on the Progressive Mathematics Test-Form B.[1/]

Intelligence-Quotient Groups	Frequencies by Grade Placements on Test									
	16	15	14	13	12	11	10	9	8	7
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
130 and Above I		3								
110-129 II	2		10	1	2			1	1	
90-109 III			1	9	4	4	2			1
70-89 IV			2			1	1	1		
Total	2	3	13	10	6	5	3	2	1	1

1/ Opp. Cit. p. 2

Table IV. Errors Classified by Standard Test-Advanced Form B.[1]

Types of Errors	Frequencies of Errors on Pretest	
	Multiplication	Division
Zeros in Multiplicand	7	
Zeros in Multiplier	9	
Two-Place Multipliers	10	
Denominate Numbers	36	
Multiplying Denominators	11	
Fractions and Decimals	10	
Fractions and Mixed Numbers	16	
Cancellation of Fractions	17	18
Abstract Numbers	39	44
Tables	10	14
Pointing off Decimals	26	18
Zeros in Quotient		6
Remainders		12
Inverting Divisors		33
Mixed Numbers		32
Reducing Fractions to Decimals		24

1/ Opp. Cit. p. 2

CHAPTER II

UNIT ORGANIZATION OF THE TOPIC MULTIPLICATION

General Statement of the Unit

Multiplication is a short method of addition in which a repeated addend becomes the multiplicand, and the number of times that it is repeated becomes the multiplier. All possible short methods should be used in doing mathematics, and one should have a high degree of efficiency in this fundamental-process timesaving-method.

Detail Description or Delimitation of the Unit

1. The process of multiplication involves a multiplicand, a multiplier and a product.

2. A multiplicand is the repeated addend or the number to be multiplied by another number.

3. A multiplier is the number of times an addend is repeated or the number which is multiplied times another number.

4. A product is the result of multiplying the multiplier times the multiplicand.

5. The multiplier and the multiplicand together are called factors of the product.

6. A cardinal rule of multiplication is that any number times zero is always zero, and zero times any number is also zero.

7. If the multiplicand is a concrete number, the product is a denominate number specifying the unit or units measured.

8. The factors of a product may be whole-numbers, mixed-numbers, common-fractions, decimal-fractions or any combination of these numbers.

9. To multiply with a mixed-number, it is best to convert it to an improper fraction.

10. To multiply common-fractions, find the product of the numerators and place it over the product of the denominators.

11. To multiply a whole-number times a common-fraction, multiply the number times the numerator of the fraction only--never times the denominator.

12. When decimals are used as factors, the product will have as many places to the right of the decimal point as there are places to the right of the decimal point in both factors added together.

13. When the factors are common-fractions and decimal-fractions, it is best to convert one to the other so that they will be all common or all decimal-fractions.

14. The accuracy of multiplication may be checked by

dividing the product by the multiplier, which should result in the multiplicand.

15. Multiplication is used in industry to figure payroll, taxes, depreciation, unit costs, selling price, inventory costs, turnover, etc.

16. Multiplication is used in business to figure salaries, taxes, inventories, selling price, operating expenses, etc.

17. Multiplication is used by the private individual to figure budgets, income, expenses, savings, etc.

18. Multiplication is used by the professional person to figure taxes, depreciation, income, salaries, etc.

Incidental and Indirect Learning Products

1. A better understanding of what multiplication really is.

2. An appreciation of how extensively multiplication is used.

3. A keener awareness of how much multiplication shortens the work of computation and insures accuracy.

List of Readings for Teacher

Harl R. Douglass and Lucien B. Kinney, Senior Mathematics. Henry Holt and Company. New York, New York, 1945.

Leo J. Brueckner, Foster E. Grossnickle and Fred L. Bedford, Arithmetic We Use. The John C. Winston Company. Los Angeles, California, 1944.

Preston E. Curry and Ralph R. Rice, Business Arithmetic. Southwestern Publishing Company. New York, New York, 1934.

N. J. Lennes, Practical Mathematics. The Macmillan Company. New York, New York, 1937.

Walter W. Hart, Basic Mathematics. D. C. Heath and Company. Boston, Massachusetts, 1942.

Unit Assignment in Multiplication

Introductory Activities (5)

Study the results of your pretest

Multiplication Pretest

(1) 532 x 6 =

(2) 406 x 7 =

(3) 481 x 27 =

(4) 976 x 40 =

(5) 2034 x 508 =

(6) 3 yd. 2 ft. 2 in. x 8 =

(7) 4 x 1/4 =

(8) 1/3 x 1/3 =

(9) 1/2 x 2/9 =

(10) 3/4 x 8/9 =

(11) 8 x 4 1/2 =

(12) 7 1/3 x 4/5 =

(13) 6 3/7 x 3 1/9 =

(14) 53 3/4 x 12 =

(15) 32.95 x 3 1/5 =

(16) 683.7 x 4 =

(17) 46.27 x .046 =

(18) 5 x 30 % of 20 =

(19) 3m x 4m =

(20) $(a-b)(a-b^2)$ =

to ascertain what type of errors you made according to the classification chart of errors that will follow,

Classification of Errors by Problems on the Pretest (6)

Errors	Problems
1. Zeros in Multiplicand	2 and 5
2. Zeros in Multiplier	4 and 5

3.	Two place Multipliers	3, 4 and 14
4.	Denominate Numbers	6
5.	Multiplying Denominators	8
6.	Fractions and Decimals	15
7.	Fractions and Mixed Numbers	12
8.	Cancellation of Fractions	7, 9, 10, 11 and 13
9.	Abstract Numbers	19 and 20
10.	Tables	1, 2, 3, 4 and 5
11.	Pointing off Decimals	16, 17 and 18

then work the examples again and have your work checked at the desk.

After you have corrected all of the errors on your pretest, ask at the desk for typical problems like those you did incorrectly on the pretest. If you can do the typical problems correctly, you have overcome your indicated deficiencies and you are ready for the next phase of the assignment.

Core Activities

To strengthen the skill you already have in multiplication and to acquire new skill in those parts which you got wrong on the pretest, study the list of references given below and do ten problems under each reference for each type of error you made on the pretest or as many more of the problems as you feel necessary to build yourself up to a high

degree of proficiency in this process.

Optional Activities

For further or optional study of multiplication, make a tabulation study of how extensively it is used in other subjects such as algebra, physics, woodworking, trigonometry, typewriting, geometry, etc.

Also make a similar study of how extensively multiplication is used in industry, business, professions and private life.

Evaluative Activities

At the end of three weeks you will be given a standard test in multiplication to ascertain if you have increased your proficiency in this fundamental-process of mathematics.

List of Multiplication References

	Pages
1. Senior Mathematics	
Zeros in Multiplicand Zeros in Multiplier Pointing off Decimals Two Place Multipliers	(5, 7, 10, 11, 23, 67, 68, (69, 94, 328, 376, 377, 378, (387, 393, 394, 395, 396 (and 397
Multiplying Denominators Pointing off Decimals Fractions and Decimals Fractions and Mixed Numbers Cancellation of Fractions	(5, 7, 10, 11, 22, 23, 67, (68, 69, 94, 128, 376, 377, (378, 385, 386, 387, 388, (389, 393, 394, 395, 396 and 397
Tables	Common to all multiplication problems
2. Arithmetic We Use	
Zeros in Multiplicand Pointing off Decimals	(13, 59, 418, 419, 426 and (427

Zeros in Multiplier
Two Place Multipliers

Multiplying Denominators — 37, 423 and 424
Fractions and Mixed Numbers
Cancellation of Fractions

3. Business Arithmetic

Zeros in Multiplicand — 49 thru 60 and 119 thru 122
Zeros in Multiplier
Pointing off Decimals
Two Place Multipliers

Denominate Numbers — 379 thru 398

Multiplying Denominators — 88 thru 97
Pointing off Decimals
Fractions and Decimals
Fractions and Mixed Numbers
Cancellation of Fractions

4. Practical Mathematics

Zeros in Multiplier — 19, 20, 21 and 23
Pointing off Decimals
Two Place Multipliers
Zeros in Multiplicand

Multiplying Denominators — 33, 34, 35, 39 and 40
Pointing off Decimals
Fractions and Mixed Numbers
Cancellation of Fractions

CHAPTER III

UNIT ORGANIZATION OF THE TOPIC DIVISION

General Statement of the Unit

To compute speedily and accurately one must have a good working knowledge of the fundamental-mathematical-process division. Division is really a short method of subtraction in which the minuend becomes the dividend, the subtrahend becomes the divisor and the number of times the subtrahend is taken from the minuend becomes the quotient.

Detail Description or Delimitation of the Unit

1. The process of division involves a dividend, a divisor, a quotient and perhaps a remainder.

2. A dividend is the number into which another number is divided.

3. A divisor is a number which is divided into another number.

4. A quotient is the number of times a divisor is divided into a dividend.

5. If the divisor is not contained in the dividend an even number of times, the uneven part is called the remainder.

6. Division may be checked for accuracy by multiplying the quotient times the divisor and adding the remainder, which should result in the dividend.

7. If a decimal is used for the divisor, first remove its decimal point and move the decimal point to the right in the dividend as many places as there were places to the right of the point in the divisor.

8. When a common-fraction is used as the divisor, invert it and procede as in multiplication.

9. When a mixed number is used as the divisor, convert it to an improper-fraction and procede as in multiplication.

10. When common-fractions and decimal-fractions are used together in division, it is best to convert one to the other so that you will have all common-fractions or all decimal-fractions.

11. A cardinal rule of division is that any number divided into zero is always zero, and a zero divided into a number is always zero. !!!

12. Division is used in industry to figure pay-roll, taxes, depreciation, unit costs, selling price, inventory costs, turnover, etc.

13. Division is used in business to figure salaries, taxes, inventories, selling price, operating expenses, etc.

14. Division is used to figure budgets, income, expenses, savings, etc. by the private individual.

15. Division is used by the professional person to figure taxes, depreciation, income, salaries, etc.

16. The quotient in division may be a whole-number, a mixed-number, a decimal-fraction, an improper-fraction or a common-fraction.

List of Readings for Teacher

Harl R. Douglass and Lucien B. Kinney, Senior Mathematics. Henry Holt and Company. New York, New York, 1945.

Leo J. Brueckner, Foster E. Grossnickle and Fred L. Bedford, Arithmetic We Use. The John C. Winston Company. Los Angeles, California, 1944.

Preston E. Curry and Ralph R. Rice, Business Arithmetic. Southwestern Publishing Company. New York, New York, 1934.

N. J. Lennes, Practical Mathematics. The Macmillan Company. New York, New York, 1937.

Walter W. Hart, Basic Mathematics. D. C. Heath and Company. Boston, Massachusetts, 1942.

Note: The incidental and indirect learning products in this unit are the same as those for the multiplication unit.

Unit Assignment in Division

Introductory Activities

Study the results of your pretest

Division Pretest

(1) 60 ÷ 6 =

(2) 424 ÷ 4 =

(3) 13464 ÷ 33 =

(4) 8000 ÷ 200 =

(5) 5674 ÷ 63 =

(6) 1 ÷ 1/3 =

(7) 1/4 ÷ 4 =

(8) 8 ÷ 4/5 =

(9) 1/2 ÷ 1/2 =

(10) 5/8 ÷ 1/4 =

(11) $5\ 1/3 \div 3/4 =$

(12) $6\ 3/5 \div 3\ 1/8 =$

(13) $80 \div 2\ 1/2 =$

(14) $127\ 1/3 \div 5 =$

(15) $9 \div .03 =$

(16) $7.12 \div 2 =$

(17) $.712 \div .02 =$

(18) 1/3 of 27 ÷ 1/6 of 18 =

(19) $\frac{x^2 - x}{x} =$

(20) $\frac{4a^3 - 4a^2b \neq ab - b^2}{a - b} =$

to ascertain what type of errors you made according to the classification chart of errors that will follow,

Classification of Errors by Problems on the Pretest

Errors	Problems
1. Zeros in Quotient	1 thru 4
2. Remainders	5
3. Inverting Divisors of Fractions	6 thru 13
4. Mixed Numbers	11 thru 13
5. Reducing Fractions to Decimals	14
6. Pointing off Decimals	15 thru 17
7. Cancellation of Fractions	18
8. Abstract Numbers	19 and 20
9. Tables	1 thru 5

then work the examples again and have your work checked at the desk.

Core Activities

To strengthen the skill you already have in division and to acquire new skill in those parts which you got wrong on the pretest, study the list of references given below

and do ten problems under each reference for each type of error you made on the pretest or as many more of the problems as you feel necessary to build yourself up to a high degree of proficiency in this process.

Optional Activities

For further or optional study of division, make a tabulation study of how extensively it is used in algebra, physics, machine shop work, woodworking, geometry, trigonometry, typewriting, etc.

Also make a similar study of how extensively division is used in industry, business, professions and in private life.

Evaluative Activities

At the end of three weeks you will be given a standard test in division to ascertain if you have increased your proficiency in this fundamental process of mathematics.

List of Division References

	Pages
1. Senior Mathematics	
Zeros in Quotient Remainders Inverting Divisors of Fractions Mixed Numbers Cancellation of Fractions	(5, 7, 11, 22, 23, 68, 69, (74, 94, 127, 128, 215, 328, (378, 379, 389, 390, 391, (392, 393, 397, 398, 399
Reducing Fractions to Decimals Pointing off Decimals	(397, 398, 399, 400, 401, (402
Tables	Common to all division problems

2. Business Arithmetic

Zeros in Quotient	98 thru 107, 123 thru 128
Remainders	
Inverting Divisors of Fractions	
Mixed Numbers	
Cancellation of Fractions	
Denominate Numbers	379 thru 398
Reducing Fractions to Decimals	76, 123 thru 128
Pointing off Decimals	

3. Arithmetic We Use

Zeros in Quotient	14, 38, 419, 420, 424, 425
Remainders	
Inverting Divisors of Fractions	
Mixed Numbers	
Cancellation of Fractions	
Pointing off Decimals	427, 428

4. Practical Mathematics

Zeros in Quotient	(24, 25, 27, 29, 32, 33, 34,
Remainders	(41
Inverting Divisors of Fractions	
Mixed Numbers	
Cancellation of Fractions	
Reducing Fractions to Decimals	26, 27, 32, 33, 42
Pointing off Decimals	

CHAPTER IV

SUMMARIZATION OF TEACHING TWO UNITS IN GENERAL MATHEMATICS ON THE TWELFTH-GRADE LEVEL

General Remarks About Both Units

As originally planned, the purpose of these units in multiplication and division is to refresh the students in the simple mechanics of arithmetical computation, not to develop new and advanced theories of mathematics.

The units are specifically organized to overcome the errors listed in table 4 page 7, and charts on pages 11 and 18, which were indicated by the pretests in each unit respectively.

Each unit has a three weeks time allotment beginning with a pretest and ending with a final test exactly like the pretest.

Although these tests were very elementary for the better students, they all did them very consentaneously, and the results showed that they all made errors of one type or another indicating that no member of the class was perfect in these two phases of computation either before nor after the units were taught.

In addition to the optional activities in the units, and to further challenge the better students while the poorer students relearned their fundamentals, I prepared a battery of fifteen problem sheets containing ten examples each to be done voluntarily and in any order the student desired. These problems were selected from a book written by James W. Calley "Complete Courses in Civil Service, 1937 edition. The examples in this battery embody the fundamental processes of arithmetic, but they also require mental deduction, analysis and combination of related facts before computation can be made.

Some of the students never got above the plain mechanics of arithmetic and even these plain mechanics could not be combined in one problem involving the four processes to obtain one result.

Specific Remarks About Multiplication

To show more specifically what effect the teaching of the unit had had on the students, I prepared two charts - tables 1 and 2 on pages 25 and 26 showing the results on the two students having the highest and the lowest intelligence quotient in each group; and a general chart - table 3 on page 27 showing the result in total.

Of these three charts, table 1 indicates that seven out of the eleven students benefitted by the unit, four remained the same and no one regressed; table 2 indicates

that three out of eight students benefitted by the unit, four remained the same and one regressed; and table 3 indicates that twenty-one students benefitted by the unit, eleven remained the same and fourteen regressed.

The regression indicated in table 3 represents better than thirty per cent of the class, which clearly shows the ineffectiveness of this unit which must be revised.

To explain this substantial regression, I referred to the worksheet for multiplication in the appendix page i; and there I found that of the eleven types of errors analyzed, the students had improved in six types and had regressed in five types.

By taking advantage of this fact, I shall revise the references covering Tables, Zeros in Multiplicand, Zeros in Multiplier, Fractions and Decimals, and Abstract Numbers to strengthen these areas next year.

Specific Remarks About Division

The same three charts were prepared to analyze the results of division as were used for multiplication mentioned above.

Of these three charts table 4 on page 28 indicates that eight out of the eleven students benefitted by the unit, two remained the same and one regressed; table 5 on page 29 indicates that six out of eight students benefitted by the unit, one remained the same and one regressed; and table 6

on page 30 indicates that thirty-one students improved as a result of the unit, seven remained the same and eight regressed.

Although there normally should not be regression as a result of teaching the unit, this is comparatively insignificant and probably due to overapprehensiveness concerning the possible errors involved in division.

Final Remarks About Both Units

Although the same time and effort was spent on these two units, the results in division were for better than those in multiplication.

This difference might be due to the fact that both the teacher and the students were more familiar with this type of assignment in the second unit after having completed the first one.

In any event, the units proved better suited to the situation than the old-type single-lesson plan, and shall be continued and improved upon in future years.

Table 1. Comparing Results on the Multiplication Final Test With Those on the Pretest According to the Two Highest Intelligence Quotients in Each Group

Intelligence-Quotient Groups	Improvement in Multiplication as a Result of Teaching the Unit					
	Pretest		Final Test		Percentile Net Change	
	Raw Score	Percentile Score	Raw Score	Percentile Score	Increase	Decrease
1	2	3	4	5	6	7
130 and Above						
I	15	50	18	80	30	
	18	80	19	90	10	
110-129	1/					
II	19	90	19	90		
	16	60	16	60		
	17	70	18	80	10	
	16	60	17	70	10	
90-109						
III	16	60	17	70	10	
	14	40	15	50	10	
70-89	2/					
IV	18	80	18	80		
	13	30	14	40		
	14	40	14	40	10	

1/ Three Duplicate Intelligence Quotients

2/ Two Duplicate Intelligence Quotients

Table 2. Comparing Results on the Multiplication Final Test With Those on the Pretest According to the Two Lowest Intelligence Quotients in Each Group

Intelligence-Quotient Groups	Improvement in Multiplication as a Result of Teaching the Unit					
	Pretest		Final Test		Percentile Net Change	
	Raw Score	Percentile Score	Raw Score	Percentile Score	Increase	Decrease
1	2	3	4	5	6	7
130 and Above I	18 16	80 60	19 19	90 90	10 30	
110-129 II	15 12	50 25	15 12	50 25		
90-109 III	18 12	80 25	18 12	80 25		
70-89 IV	19 15	90 50	15 17	50 70	20	40

Table 3. Chart of Intelligence Groups Showing Total Results of Teaching the Multiplication Unit

Intelligence-Quotient Groups	Total Results of Teaching the Multiplication Unit		
	Improved	Remained the Same	Regressed
1	2	3	4
130 and Above I	3		
110-129 II	6	5	6
90-109 III	10	4	7
70-89 IV	2	2	1
Total	21	11	14

Table 4. Comparing Results on the Division Final Test With Those on the Pretest According to the Two Highest Intelligence Quotients in Each Group

Intelligence-Quotient Groups	Improvement in Division as a Result of Teaching the Unit					
	Pretest		Final Test		Percentile Net Change	
	Raw Score	Percentile Score	Raw Score	Percentile Score	Increase	Decrease
1	2	3	4	5	6	7
130 and above I	17	80	18	85	5	
	16	75	18	85	10	
110-129 II	1/					
	14	70	17	80	10	
	17	80	18	85	5	
	20	99	18	85		14
	18	85	18	85		
90-109 III	16	75	16	75		
	12	50	14	70	20	
70-89 IV	2/					
	16	75	18	85	10	
	13	60	15	75	15	
	8	15	12	50	35	

1/ Three Duplicate Intelligence Quotients

2/ Two Duplicate Intelligence Quotients

Table 5. Comparing Results on the Division Final Test With Those on the Pretest According to the Two Lowest Intelligence Quotients in Each Group

Intelligence-Quotient Groups	Improvement in Division as a Result of Teaching the Unit					
	Pretest		Final Test		Percentile Net Change	
	Raw Score	Percentile Score	Raw Score	Percentile Score	Increase	Decrease
1	2	3	4	5	6	7
130 and Above						
I	16	75	18	85	10	
	14	70	18	85	15	
110-129						
II	11	40	12	50	10	
	13	60	15	75	15	
90-109						
III	17	80	18	85	5	
	14	70	13	60		10
70-89						
IV	18	85	18	85		
	14	70	16	75	5	

Table 6. Chart of Intelligence Groups Showing Total Results of Teaching the Division Unit

Intelligence-Quotient Groups	Total Results of Teaching the Division Unit		
	Improved	Remained the Same	Regressed
1	2	3	4
130 and Above I	3		
110-129 II	10	3	4
90-109 III	14	3	4
70-89 IV	4	1	
Total	31	7	8

Assignment 4

1. An estate was divided among three children so the first gets 2/5, the second 3/10, and the third the remainder, which was $4,200. What was the value of the estate?

2. John and his father in 16 days complete a job which the father can do alone in 21 days. In what time can John do it alone?

3. A dog chasing a rabbit runs 11 rods while the rabbit runs 9. If the rabbit has 32 rods the start, how far must the dog run to overtake him?

4. A man worked 21 2/5 days, and after paying his board with 3/8 of his earnings, had $66 7/8 left. How much did he earn per day?

5. John, James, and Charles together have $2,210. John has 2 1/2 times as much as James, who has 7/8 as much as Charles. How much has each?

6. A and B each bought a farm, each paying the same price. A sold his for $9,810, gaining 12 1/2% of the cost. B sold his for $11,772; what per cent of the cost did B gain?

7. Three draftsmen, A, B and C, are engaged upon a piece of work. A can do it alone in 7 days, B in 15, and C in 21 days. After the three men have worked together 1 2/3 days, B stops work; how long will it take A and C, working together, to complete the work?

8. Of a quantity of grain in a certain elevator 42 6/7% is wheat, and 37 1/2% oats; the remainder, amounting to 34,386 bu., consists of rye and corn, there being five times as much rye as corn. How many bu. of wheat in the elevator?

9. The appropriation for the commission for 1904 was $378,100.80, making the average cost of each appointment $8.40. If 38% of those examined that year failed to pass and 55% of those who passed were appointed, how many persons were examined by the commission that year?

10. Find the duty on 275 boxes cigars, containing 100 cigars each, invoiced at $6.50 per box; weight 14 lbs. per 1,000; duty $4.50 per lb. and 25% ad valorem.

Assignment 8

1. If $800 placed at interest amounts to $880 in 15 months, what sum must be placed at interest at the same rate to amount to $975 in one year?

2. A man bought a house and lot, paying three times as much for the house as for the lot. He afterwards sold the house and lot for $2002.50, gaining 20% on the house and losing 15% on the lot. Find cost of each.

3. A merchant bought silks at 90¢ per yard, marked them to sell at an advance of 40%, but sold them at a reduction of 33 1/3% from the marked price. If his losses from the sales amounted to $75.60, how many yards did he sell?

4. A broker sold two houses and lots for $2500 each. On one he gained 20% and on the other he lost 20%. What was his gain or loss on both?

5. An agent charged 5% for selling corn and 2% for investing the proceeds in oats. If his com. on the oats amounted to $280, what was the selling price of the corn?

6. By selling a farm for $4320 a gain of 20% was realized; if it had been sold at 10% loss the price per acre would have been $9 less. How many acres in the farm?

7. The interest is $52.56; the time is 2 yrs., 5 mo., 6 days; the rate is 6%; what is the principal?

8. If 12 lbs. of cheese and 16 lbs. of butter cost $6.20, and 20 lbs. of butter and 18 lbs. of cheese cost $8.02, what is the cost of each per lb.?

9. The duties on two invoices when figured at 35% each amounted to $768.25, but when figured at 24% and 35%, respectively, the duties were $675.30. What was the value of each invoice?

10. if 12 lbs. of tea and 24 lbs. of coffee cost $12.48 and 16 lbs. of coffee and 7 lbs. of tea cost $7.72, what is the price of each per lb.?

Assignment 12

1. The outside dimensions of a box without cover are 4 ft. long, 3 1/2 ft. wide, and 3 ft. 2 in. deep. How many gallons of water will it hold, allowing 1 1/2 in. for thickness of walls?

2. A man bought a farm which he offered to sell at a gain of 25% on the cost. He afterward sold it for $7,955, which was 9/16% less than he asked for it first. Find the cost of the farm.

3. A house and lot is sold at a gain of 16 2/3%, and the proceeds invested in stocks, which were sold at a gain of 14 2/7%. If the gain on both transactions is $2,800, what was the cost of the house and lot?

4. A person in purchasing sugar found that if he bought sugar at 11 cents he would lack 30 cents of having enough to pay for it, so he bought sugar at 10 1/2 cents and had 15 cents left. How many pounds did he buy?

5. A lot is sold at 20% gain; had the cost been $275 more the loss would have been 20%. What was the cost of the lot?

6. What will be the proceeds of a 90-day note for $720 bearing seven per cent interest and discounted 25 days after date at 10%?

7. For how much must a house worth $800, with contents worth $3,000 be insured at 1 1/2% to cover the cost of the premium and 3/4 the value of the property.

8. The front wheels of a vehicle are 6 ft. in diameter and the rear wheels 9 ft.; the front wheels make 400 revolutions in traveling a certain distance. Give the distance traveled in miles, rods and inches and the number of revolutions made by the hind wheel.

9. What is the amount of $1,120 for 2 yrs. 9 mos. 15 days at 6%?

10. If to the product of 12 4/5 and another number 21 5/16 be added the result is 93.3125. If the other number had been 1/5 greater, what would the product have been?

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B[1/]
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL

Mathematical Reasoning		Three Years in High School					Two Years in High School						
I.Q. of Students		134	129	127	120	90	134	130	127	126	122	120	116
Number Concepts	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	17	18	19	16	13	18	16	15	14	15	17	11
Symbols and Rules	Possible	15	15	15	15	15	15	15	15	15	15	15	15
	Actual	13	14	14	14	12	13	13	13	15	13	10	12
Numbers and Equations	Possible	10	10	10	10	10	10	10	10	10	10	10	10
	Actual	7	9	9	9	10	9	10	10	8	9	9	10
Problems	Possible	15	15	15	15	15	15	15	15	15	15	15	15
	Actual	14	13	14	14	12	14	14	10	13	13	11	13
Total Raw Scores		51	54	56	53	47	54	53	48	50	50	47	46
Percentile Rank for Grade 12		85	90	99	90	75	90	90	80	80	80	80	75
Grade Placement		15.5	16	16	16	15	16	16	15	15.5	10.5	15	14.5
Mathematical Fundamentals													
Addition	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	19	20	20	18	19	19	17	16	18	18	19	18
Subtraction	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	18	19	20	18	15	18	18	19	17	17	18	18
Multiplication	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	19	19	18	14	18	18	19	17	15	17	15	18
Division	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	18	17	18	12	18	18	18	18	14	15	15	18
Total Raw Scores		74	75	76	62	70	73	72	70	64	67	67	72

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Fundamentals	Three Years in High School					Two Years in High School						
I.Q. of Students	134	129	127	120	90	134	130	127	126	122	120	116
Percentile Rank for Grade 12	85	90	90	60	80	85	80	80	70	75	75	80
Grade Placement	15	15	15.5	13.4	14.5	14.5	14.5	14.5	13.7	14	14	14.5
Total Mathematics Score	125	129	132	115	117	127	125	118	114	117	114	118
Total Mathematics Percentile	85	90	95	75	80	90	85	80	75	80	75	80
Total Mathematics Grade Placement	15	16	16	14.5	14.5	15.5	15	14.5	14.5	14.5	14.5	14.5

1/ Ernest W. Teigs and Willis W. Clark, Progressive Achievement Test - Form B. California Test Bureau, Los Angeles, California, 1943.

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Reasoning		Two Years in High School										
I.Q. of Students		115	114	113	107	102	100	97	95	83	83	82
Number Concepts	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	14	15	15	12	12	10	14	16	12	14	13
Symbols and Rules	Possible	15	15	15	15	15	15	15	15	15	15	15
	Actual	12	13	7	10	10	9	12	9	6	12	10
Numbers and Equations	Possible	10	10	10	10	10	10	10	10	10	10	10
	Actual	8	6	6	9	5	8	10	5	7	9	9
Problems	Possible	15	15	15	15	15	15	15	15	15	15	15
	Actual	14	14	13	11	13	12	8	14	5	9	14
Total Raw Scores		48	48	41	42	40	39	44	44	30	44	46
Percentile Rank for Grade 12		80	80	20	70	60	60	20	20	30	20	75
Grade Placement		15	15	13.5	13.8	13.3	13	14.3	14.3	10.8	14.3	14.5
Mathematical Fundamentals												
Addition	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	16	15	13	14	18	18	17	19	7	18	18
Subtraction	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	16	17	14	14	14	18	18	18	13	14	17
Multiplication	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	17	14	15	15	17	16	7	18	14	15	14
Division	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	15	18	12	14	14	15	16	18	12	18	14
Total Raw Scores		64	64	54	57	63	67	58	73	46	65	63

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Fundamentals	Two Years in High School										
I.Q. of Students	115	114	113	107	102	100	97	95	83	83	82
Percentile Rank for Grade 12	70	70	40	50	60	75	50	85	25	70	60
Grade Placement	13.7	13.7	11.5	12.3	13.5	14	12.5	15	9.5	13.8	13.5
Total Mathematics Score	112	112	95	99	103	106	102	117	76	109	109
Total Mathematics Percentile	75	75	50	60	60	70	60	80	25	70	70
Total Mathematics Grade Placement	14.3	14.3	12.6	13.1	13.5	13.8	13.4	14.5	10.3	14	13.8

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Reasoning		One Year in High School											
I.Q. of Students		126	116	110	100	99	99	98	97	96	94	90	90
Number Concepts	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	7	11	9	16	13	12	15	12	12	15	10	6
Symbols and Rules	Possible	15	15	15	15	15	15	15	15	15	15	15	15
	Actual	6	4	8	9	5	7	8	10	7	10	7	4
Numbers and Equations	Possible	10	10	10	10	10	10	10	10	10	10	10	10
	Actual	2	9	9	7	2	4	9	7	3	10	9	5
Problems	Possible	15	15	15	15	15	15	15	15	15	15	15	15
	Actual	11	11	7	4	10	9	12	11	10	10	9	9
Total Raw Scores		26	35	33	36	30	32	44	40	32	45	35	24
Percentile Rank for Grade 12		20	40	40	50	30	30	70	60	30	80	40	20
Grade Placement		9.8	12	11.5	12.3	10.8	11.3	14.3	13.3	11.3	14.5	12	9.3
Mathematical Fundamentals													
Addition	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	4	12	12	13	17	12	12	10	18	18	17	13
Subtraction	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	9	16	13	0	11	17	10	17	17	15	16	12
Multiplication	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	12	13	13	17	15	14	16	11	16	12	17	12
Division	Possible	20	20	20	20	20	20	20	20	20	20	20	20
	Actual	15	15	16	18	12	17	13	13	17	14	15	13
Total Raw Scores		40	56	54	48	55	60	51	51	68	59	65	50

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Fundamentals	One Year in High School											
I.Q. of Students	126	116	110	100	99	99	98	97	96	94	90	90
Percentile Rank for Grade 12	15	40	40	80	40	60	30	30	75	50	70	30
Grade Placement	8.5	12	11.5	10	11.8	13	10.8	10.8	14.2	12.8	13.8	10.5
Total Mathematics Score	66	91	87	84	85	92	94	91	100	104	100	74
Total Mathematics Percentile	20	40	30	30	30	50	50	40	60	60	60	25
Total Mathematics Grade Placement	9.1	12.1	11.6	11.3	11.4	12.3	12.5	12.1	13.2	13.6	13.2	10

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Reasoning		No Previous Mathematics in High School										
I.Q. of Students		127	117	115	109	104	100	99	92	92	83	82
Number Concepts	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	14	13	6	12	10	7	13	7	12	5	11
Symbols and Rules	Possible	15	15	15	15	15	15	15	15	15	15	15
	Actual	8	11	2	6	3	3	6	3	7	0	4
Numbers and Equations	Possible	10	10	10	10	10	10	10	10	10	10	10
	Actual	9	6	3	5	6	4	2	2	2	1	2
Problems	Possible	15	15	15	15	15	15	15	15	15	15	15
	Actual	15	14	8	10	12	12	9	10	12	10	7
Total Raw Scores		46	44	19	33	31	26	30	22	33	16	24
Percentile Rank for Grade 12		75	70	10	40	30	20	30	15	40	5	25
Grade Placement		14.5	14.3	8	11.5	11	9.8	10.8	8.8	11.5	7.3	9.3
Mathematical Fundamentals												
Addition	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	17	17	13	16	11	10	13	4	18	13	14
Subtraction	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	17	16	14	17	17	15	14	8	16	12	15
Multiplication	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	16	16	4	15	17	15	15	10	17	14	17
Division	Possible	20	20	20	20	20	20	20	20	20	20	20
	Actual	18	16	10	18	16	11	17	10	18	15	16
Total Raw Scores		68	65	41	66	61	51	59	32	69	54	62

WORKSHEET USED TO ANALYZE THE ENTIRE PROGRESSIVE MATHEMATICS TEST - ADVANCED FORM B
ARRANGED BY STUDENT'S PREVIOUS MATHEMATICS TRAINING IN SECONDARY SCHOOL (continued)

Mathematical Fundamentals	No Previous Mathematics in High School										
I.Q. of Students	127	117	115	109	104	100	99	92	92	83	82
Percentile Rank for Grade 12	75	70	20	70	60	30	50	10	85	40	60
Grade Placement	14.3	13.8	8.7	13.9	13.2	10.8	12.8	7.2	14.4	11.5	13.4
Total Mathematics Score	114	109	60	99	92	77	89	54	112	70	86
Total Mathematics Percentile	75	70	15	60	50	25	40	10	85	20	30
Total Mathematics Grade Placement	14.5	14	8.5	13.1	12.3	10.4	11.9	7.9	13.4	9.3	11.5

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION

I.Q. of Students		134	134	130	129	127	127	127	126	126	122	120	120
Grade Placement on Entire Test[1]		15.5	15	15	16	14.5	16	14.5	14.5	13.8	14.5	14.5	14.5
Raw Score	First	15	18	16	19	16	17	16	17	12	17	18	16
Percentile Score	First	50	80	60	90	60	70	60	70	25	70	80	60
Raw Score	Second	18	19	19	19	16	18	17	15	14	17	15	14
Percentile Score	Second	80	90	90	90	60	80	70	50	40	70	50	40
Percentile Improvement		30	10	30			10	10		15			
Same Percentile					X	X					X		
Percentile Decrease									20			30	20
Tables	First			X						X			
	Second	X						X	X	X			
Zeros in Multiplicand	First			X						X			
	Second								X	X			
Zeros in Multiplier	First			X						X			
	Second	X						X					
Two-place Multipliers	First			X						X			
	Second									X			X
Denominate Numbers	First		X			X	X			X	X	X	
	Second									X			X
Multiplying Denominators	First					X				X	X		
	Second					X							X
Cancellation of Fractions	First	X	X				X			X			X
	Second					X	X	X				X	X

[1] Grade Placement on Entire Test

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		134	134	130	129	127	127	127	126	126	122	120	120
Fractions and Mixed Numbers	First	X			X					X			X
	Second												
Fractions and Decimals	First			X				X	X	X	X		
	Second		X							X		X	X
Pointing off Decimals	First	X		X				X	X	X	X		X
	Second							X	X	X		X	X
Multiplying Abstract Numbers	First	X		X		X			X	X	X	X	X	
	Second	X		X	X	X				X	X	X	

1/ Ernest W. Teigs and Willis W. Clark, Progressive Achievement Test - Form B. California Test Bureau, Los Angeles, California, 1943.

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		117	116	116	115	115	114	113	110	109	107	104	102
Grade Placement on Entire Test		14	14.5	9.1	14.3	8.5	14.3	12.6	12.1	13.1	13.1	12.3	13.5
Raw Score	First	15	17	14	16	15	17	15	12	16	14	16	16
Percentile Score	First	50	70	40	60	50	70	50	25	60	40	60	60
Raw Score	Second	16	18	12	17	20	14	15	12	17	15	17	17
Percentile Score	Second	60	80	25	70	4	40	50	25	70	50	70	70
Percentile Improvement		10	10		10					10	10	10	10
Same Percentile								X	X				
Percentile Decrease				15		46	30						
Tables	First	X			X				X			X	
	Second			X		X	X						
Zeros in Multiplicand	First	X			X				X				
	Second			X		X	X						
Zeros in Multiplier	First	X			X				X				
	Second			X		X	X						
Two-place Multipliers	First	X			X				X				
	Second					X	X						
Denominate Numbers	First		X	X	X		X	X	X	X	X	X	X
	Second			X		X	X			X	X	X	X
Multiplying Denominators	First					X		X	X				
	Second				X	X							
Cancellation of Fractions	First	X		X		X							
	Second	X		X		X	X	X	X				

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		117	116	116	115	115	114	113	110	109	107	104	102
Fractions and Mixed Numbers	First		X					X		X			X
	Second	X					X	X			X		
Fractions and Decimals	First										X		
	Second		X	X	X	X			X				
Pointing off Decimals	First	X		X					X		X		
	Second			X		X		X	X		X		
Multiplying Abstract Numbers	First	X	X	X	X	X	X	X	X	X		X	X
	Second	X	X	X	X	X	X	X	X	X	X	X	X

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		100	100	100	99	99	99	98	97	97	96	95	94
Grade Placement on Entire Test		13.8	11.6	10.4	11.3	11.9	11.4	12.3	12.5	12.1	13.2	13.6	13.2
Raw Score	First	17	12	15	16	16	12	14	14	17	17	14	15
Percentile Score	Second	70	25	50	60	60	25	40	40	70	70	40	50
Raw Score	First	16	13	15	17	15	15	14	16	16	16	12	17
Percentile Score	Second	60	30	50	70	50	50	40	60	60	60	25	70
Percentile Improvement			5		10		25		20				20
Same Percentile				X				X					
Percentile Decrease		10				10				10	10	20	
Tables	First		X				X		X				
	Second		X				X					X	
Zeros in Multiplicand	First		X										
	Second		X				X					X	
Zeros in Multiplier	First		X										
	Second		X				X						
Two-place Multipliers	First		X				X						
	Second		X							X			
Denominate Numbers	First	X	X	X	X	X		X	X		X	X	X
	Second	X	X	X	X	X		X	X		X	X	X
Multiplying Denominators	First										X		
	Second												
Cancellation of Fractions	First		X				X	X				X	
	Second									X			X

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		100	100	100	99	99	99	98	97	97	96	95	94
Fractions and Mixed Numbers	First			X			X		X				X
	Second	X				X	X	X	X	X			
Fractions and Decimals	First	X							X				X
	Second	X	X	X		X		X		X		X	
Pointing off Decimals	First	X	X	X	X	X	X	X	X			X	X
	Second			X			X	X	X	X	X	X	
Multiplying Abstract Numbers	First	X	X	X	X	X	X	X	X		X	X	X
	Second	X	X	X	X	X	X	X	X	X	X	X	X

WORKSHEET USED TO ANALYZE THE RESULTS OF MULTIPLICATION (continued)

I.Q. of Students		92	92	91	90	90	83	83	83	82	82	
Fractions and Mixed Numbers	First	X	X	X		X						
	Second	X		X	X			X				
Fractions and Decimals	First							X				
	Second	X		X		X		X	X	X		
Pointing off Decimals	First	X		X				X			X	
	Second			X				X	X	X		
Multiplying Abstract Numbers	First	X	X	X		X	X	X	X		X	
	Second	X		X	X	X	X	X	X		X	

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION

I.Q. of Students		134	134	130	129	127	127	127	126	126	122	120	120
Grade Placement on Entire Test1/		15.5	15	15	16	14.5	16	14.5	14.5	13.8	14.5	14.5	14.5
Raw Score	First	17	16	14	14	17	20	18	11	11	16	16	15
Percentile Score	First	80	75	70	70	80	99	85	40	40	75	75	75
Raw Score	Second	18	18	18	17	18	18	18	14	14	15	15	12
Percentile Score	Second	85	85	85	80	85	85	85	70	70	75	75	50
Percentile Improvement		5	10	15	10	5			30	30			
Same Percentile								X			X	X	
Percentile Decrease							14						25
Tables	First				X								
	Second			X	X			X		X			
Zeros in Quotient	First												
	Second			X						X			
Remainders	First												X
	Second				X		X	X		X			
Inverting Divisors of Fractions	First				X	X			X	X	X	X	X
	Second		X						X	X	X	X	X
Mixed Numbers	First		X	X	X				X	X	X		X
	Second		X							X	X	X	
Reducing Fractions to Decimals	First	X	X	X	X				X	X			
	Second								X				
Pointing off Decimals	First												
	Second		X						X				X

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		134	134	130	129	127	127	127	126	126	122	120	120
Cancellation of Fractions	First			X									
	Second												
Dividing Abstract Numbers	First	X	X	X	X	X		X	X	X	X	X	X
	Second	X		X		X	X	X	X	X	X	X	X

1/ Ernest W. Teigs and Willis W. Clark, Progressive Achievement Test - Form B. California Test Bureau, Los Angeles, California, 1943.

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		117	116	116	115	115	114	113	110	109	107	104	102
Grade Placement on Entire Test		14	14.5	9.1	14.3	8.5	14.3	12.6	12.1	13.1	13.1	12.3	13.5
Raw Score	First	17	9	11	17	9	15	11	13	16	12	13	15
Percentile Score	First	80	20	40	80	20	75	40	60	75	50	60	75
Raw Score	Second	16	18	15	15	10	18	12	15	16	14	16	14
Percentile Score	Second	75	85	75	75	30	85	50	75	75	70	75	70
Percentile Improvement			65	35		10	10	10	15		20	15	
Same Percentile										X			
Percentile Decrease		5			5								5
Tables	First		X	X		X		X	X				X
	Second	X				X			X		X		X
Zeros in Quotient	First												
	Second										X		
Remainders	First		X	X		X		X	X				X
	Second	X							X		X		X
Inverting Divisors of Fractions	First		X	X		X	X	X	X			X	X
	Second			X	X	X		X		X		X	X
Mixed Numbers	First		X	X		X	X	X	X		X	X	X
	Second					X							
Reducing Fractions to Decimals	First	X		X		X	X				X		
	Second	X			X	X					X		X
Pointing off Decimals	First		X	X	X				X	X	X		X
	Second			X		X			X	X	X		

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		117	116	116	115	115	114	113	110	109	107	104	102
Cancellation of Fractions	First		X	X		X		X	X	X		X	
	Second			X		X							
Dividing Abstract Numbers	First	X	X	X	X	X	X	X	X	X	X	X	X
	Second	X	X	X	X	X	X	X	X	X	X	X	X

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		100	100	100	99	99	99	98	97	97	96	95	94
Grade Placement on Entire Test		13.8	11.6	10.4	11.3	11.9	11.4	12.3	12.5	12.1	13.2	13.6	13.2
Raw Score	First	13	17	8	15	16	7	11	13	10	17	11	14
Percentile Score	First	60	80	15	75	75	10	40	60	30	80	40	70
Raw Score	Second	15	16	11	18	17	12	17	13	13	17	14	15
Percentile Score	Second	75	75	40	85	80	50	80	60	60	80	70	75
Percentile Improvement		15		25	10	5	40	40		30		30	5
Same Percentile									X		X		
Percentile Decrease			5										
Tables	First	X	X		X		X		X				
	Second	X		X			X			X			X
Zeros in Quotient	First												
	Second												
Remainders	First	X			X		X		X				
	Second	X		X						X			X
Inverting Divisors of Fractions	First	X		X	X	X	X	X	X			X	X
	Second			X		X		X	X	X	X		X
Mixed Numbers	First	X	X	X			X	X	X			X	X
	Second						X			X		X	
Reducing Fractions to Decimals	First		X	X	X		X	X	X			X	
	Second	X	X	X			X		X	X			X
Pointing off Decimals	First			X			X	X				X	X
	Second	X	X	X								X	

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		100	100	100	99	99	99	98	97	97	96	95	94
Cancellation of Fractions	First					X	X	X	X		X		
	Second												
Dividing Abstract Numbers	First	X		X	X	X	X	X	X		X	X	X
	Second	X	X	X	X	X	X	X	X	X	X	X	X

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		92	92	91	90	90	83	83	83	82	82
Grade Placement on Entire Test		7.9	13.4	13.4	14.5	10	14.5	9.3	10.3	14	11.5
Raw Score	First	11	10	13	17	14	16	13	8	18	14
Percentile Score	First	40	30	60	80	70	75	60	15	85	70
Raw Score	Second	10	18	16	18	13	18	15	12	18	16
Percentile Score	Second	30	85	75	85	60	85	75	50	85	75
Percentile Improvement			55	15	5		10	15	35		5
Same Percentile										X	
Percentile Decrease		10				10					
Tables	First			X					X		
	Second							X			
Zeros in Quotient	First										
	Second							X			
Remainders	First								X		
	Second							X			
Inverting Divisors of Fractions	First	X	X	X		X	X	X	X		X
	Second			X		X		X	X		
Mixed Numbers	First	X	X	X	X	X	X		X		X
	Second	X			X			X		X	
Reducing Fractions	First	X	X				X	X	X		X
	Second	X						X		X	X
Pointing off Decimals	First	X	X			X		X			
	Second	X				X		X			X

WORKSHEET USED TO ANALYZE THE RESULTS OF DIVISION (continued)

I.Q. of Students		92	92	91	90	90	83	83	83	82	82	
Cancellation of Fractions	First	X	X					X	X		X	
	Second	X						X	X			
Dividing Abstract Numbers	First	X	X	X	X	X	X	X	X	X	X	
	Second	X		X	X	X	X	X	X		X	

1943 EDITION

B Advanced Mathematics Tests
High School and College

PROGRESSIVE MATHEMATICS TESTS—ADVANCED Form B

(Diagnostic Tests Keyed to the Curriculum)

Devised by Ernest W. Tiegs, Dean, University College, The University of Southern California, and Willis W. Clark, Director of Research and Guidance, Los Angeles County Schools.

Name..... Grade..... Sex: Male—Female

School..... Age..... Birthday.....

Teacher..... Date.....

TEST	SUBJECT	Possible Score	Student's Score	Percentile Rank for Grade.....	DIAGNOSTIC PROFILE (Chart Student's Percentile Rank Here) Percentile Rank 1 10 20 30 40 50 60 70 80 90 99 — 1943 Edition	Grade Placement
3.	Mathematical Reasoning	60				
A.	Number Concept	20				
B.	Symbols and Rules	15				
C.	Numbers and Equations	10				
D.	Problems	15				
4.	Mathematical Fundamentals	80				
E.	Addition	20				
F.	Subtraction	20				
G.	Multiplication	20				
H.	Division	20				
TOTAL		140				

DIAGNOSTIC ANALYSIS OF LEARNING DIFFICULTIES

(See Page 2 for Instructions)

3. Mathematical Reasoning

A. NUMBER CONCEPT:

- Writing integers 1-3
- Writing money 4
- Writing fractions 5-7
- Roman numbers 8-10
- Fractions and decimals 11-13
- Exponents and roots 14-16
- Negative numbers 17
- Abstract numbers 18-20

B. SYMBOLS AND RULES:

- Symbols 1-3, 8-10
- Vocabulary 4-7
- Rules 11-15

C. NUMBERS AND EQUATIONS:

- Negative numbers 1-4
- Solving equations 5-10

D. PROBLEMS:

- Simple problems 1-2
- Sharing and averaging 3-4
- Square and cubic measure 5-6
- Budgeting 12
- Ratio and percentage 7-11
- Insurance and discount 13-15

4. Mathematical Fundamentals

E. ADDITION:

- Simple combinations 1
- Carrying 2-4
- Zeros 1, 6
- Column addition 3, 4
- Adding money 4, 6
- Denominate numbers 4-6
- Adding numerators 7
- Reducing fractions to common denom. 8, 10-13
- Adding mixed nos. 9-13
- Adding fractions and decimals 14-15
- Writing decimals in column 16-17
- Adding percentages 18
- Adding abstract nos. 19-20

F. SUBTRACTION:

- Simple combinations 1
- Borrowing 2-5
- Zeros 1, 3, 5
- Subtracting money 4, 5
- Denominate numbers 4-6
- Subtracting numerators 7-8
- Reducing fractions to common denominators 9-10
- Integer from mixed no. 11
- Borrowing with mixed numbers 12, 13
- Subtraction: fractions and decimals 14, 15
- Writing decimals in column 16, 17
- Subt. abstract nos. 19, 20

G. MULTIPLICATION:

- Tables 1-5
- Zeros in multiplicand 2, 5
- Zeros in multiplier 4, 5
- Two-place multipliers 3-5
- Denominate nos. 6
- Mult. denominators 8
- Cancellation of fractions 7, 9, 10, 11, 13
- Fractions and mixed numbers 12
- Fractions and decimals 15
- Pointing off decimals 16, 17
- Mult. abstract nos. 19, 20

H. DIVISION:

- Tables 1-5
- Zeros in quotient 1-4
- Remainders 5
- Inverting divisor in fractions 6-13
- Mixed numbers 11-13
- Reducing fractions to decimals 14
- Pointing off decimals 15-17
- Cancel. of fract. 18
- Div. abstract nos. 19-20

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ANALYSIS OF LEARNING DIFFICULTIES

If the diagnostic profile on the first page of this test indicates that the student is making normal progress in all fields, the teacher will have no use for the following diagnostic analysis. However, where the diagnostic profile shows achievement below a desirable standard in one or more major fields, the following device will assist in identifying and analyzing the specific causes of difficulty as a basis for remedial instruction.

The numerals and capital letters in the diagnostic analysis correspond to the sections of the test similarly marked. For example, if the diagnostic profile shows unsatisfactory achievement in Test 4, Sec. E (addition in arithmetic fundamentals) an inspection of the unsatisfactory responses in this section of the test (by number) will reveal whether or not remedial instruction is needed in carrying, use of zeros, reducing to common denominators, and the like. These topics are then checked by the teacher as the basis for remedial work.

Once an adequate diagnosis has been made, remedial instruction is frequently a simple matter. However, teachers have in the past found the clerical work incident to following each individual student a heavy burden. Such extra work is almost completely eliminated if this diagnostic analysis is torn from the test booklet and kept on the teacher's desk, where the various items may be checked off as the student masters them.

TEST 3. SEC. A

Write each of these amounts on the line to the right, using numbers, like the sample.

0. Twelve 12 0

1. Six thousand fourteen _____ 1
2. Twenty thousand six _____ 2
3. Two million two hundred two _____ 3
4. Forty-six dollars and four cents _____ 4
5. Eighteen and three-fourths _____ 5
6. Six hundredths (write as decimal) _____ 6
7. Thirty-four ten-thousandths (write as a decimal) _____ 7

Draw a line under the correct number and write it on the line to the right.

8. LX means 20 40 60 80 _____ 8
9. CD means 300 400 600 900 _____ 9
10. MCXIII means 613 713 803 1113 _____ 10

Draw a line under the largest number and write it on the line to the right.

11. $\frac{2}{3}$ $\frac{5}{8}$ $\frac{4}{5}$ $\frac{5}{9}$ _____ 11
12. .068 .32 .187 .0978 _____ 12
13. 3 50% .64 1.19 _____ 13
14. 4^2 2^3 7 1^{10} _____ 14
15. $(\frac{2}{3})^2$ $\frac{2}{3}$ $(\frac{3}{5})^2$ $(\frac{4}{9})^3$ _____ 15
16. $\sqrt{.64}$ .74 $\sqrt{.49}$ .786 _____ 16
17. $\frac{12}{6}$ -7 $+5$ $+\frac{21}{7}$ _____ 17

Consider x and y as positive values.

18. x^2 x^2-1 $\frac{x^3-x}{x}$ $x(x-2)$ _____ 18
19. $\frac{4x^2-y}{x}$ $3x-y^2$ $4x$ $\frac{6x^2-2y^2}{2x}$ _____ 19
20. $(x+y)^2$ $(x-y)^2$ $(x+y)(x-y)$ x^2 _____ 20

Sec. A. Score (number right) .....

TEST 3. SEC. B

Write the correct answer on the line to the right.

1. $\sqrt{36}$ _____ 1
2. 4% of 50 = _____ 2
3. Reduce to simplest terms: $\frac{\frac{24}{3}}{\frac{12}{6}}$ _____ 3
4. What are the factors of 15? _____ 4
5. What is the factor of $x^2 + 2xy + y^2$ _____ 5
6. What is the greatest common divisor of 7, 14, and 28? _____ 6
7. What is the greatest common divisor of $2x^2-2xy$ $4x^2$ $4x^2y^2$ _____ 7
8. Solve for x. 2:8=5:x x=_____ 8

Draw a line under the correct word and write its letter on the line to the right.

9. || means (a) equal to (b) parallel (c) lines (d) therefore _____ 9
10. < means (a) centigrade (b) degree (c) less than (d) reduce _____ 10
11. π means (a) factor (b) dram (c) pi (d) radius _____ 11

These are rules used in measurement:

1. Multiply ½ base by altitude.
2. Multiply square of diameter by 3.1416.
3. Divide area by width.
4. Multiply diameter by 3.1416.
5. Multiply length by width by height.
6. Multiply width by length.

Write on the line to the right the number of the rule which is used to find each of the following:

12. Area of a rectangle _____ 12
13. Length of a rectangle _____ 13
14. Area of a triangle _____ 14
15. Volume of a rectangular prism _____ 15

Sec. B. Score (number right) .....

TEST 3. SEC. C

Work these problems and write the answers on the lines to the right.

1. Add: 71 −33 45 _____ 1
2. Subtract: 56a − 12a _____ 2
3. Multiply: 7(−4) _____ 3
4. Simplify: $\frac{-21}{7}$ _____ 4

Find the value of x in each of these equations. Write each answer on the line to the right.

5. $6x = 48$ _____ 5
6. $x + 4 = 17$ _____ 6
7. $x^2 = 25$ _____ 7
8. $\frac{x}{4} = 3$ _____ 8
9. If $x = 5$, $y = 4$, $z = 3$, find the value of d in this equation: $d = x - y + z$ _____ 9
10. If $n = 4$, $p = 2$, $r = 5$, find the value of x in this equation: $\frac{x}{n} = pr - n$ _____ 10

Sec. C. Score (number right) .....

TEST 3. SEC. D

Directions: Work these problems and write the letters of your answers on the lines to the right.

1. How much money will be required to buy four cakes of soap at 5¢ a cake and one dozen eggs at 35¢ a dozen?
   a 20¢ b 55¢ c 40¢ d 45¢ —— 1

2. How much money will be required to buy ¼ lb. of butter at 40¢ a pound, 4 lbs. sugar at 7¢ a pound, and six eggs at 40¢ a dozen?
   a $1.23 b $0.95 c $0.28 d $0.58 —— 2

3. In a "paper drive" four boys brought old paper to school as follows: Fred, 30 lbs.; Albert, 40 lbs.; Henry, 10 lbs.; and Peter, 40 lbs. What was the average number of pounds brought by these boys?
   a 40 b 30 c 35 d 25 —— 3

4. In a large store, the employees were paid monthly wages as follows:
   20 received $ 90 per month
   30 received $100 per month
   10 received $110 per month
   2 received $150 per month
   What was the average wage per month?
   a $90 b $95 c $100 d $110 —— 4

5. A rectangular playground is 200 yards wide and 400 yards long. How many square yards are there in the field?
   a 80,000 b 8,000 c 600 d 2,000 —— 5

6. A swimming pool is 20 ft. wide, 40 ft. long, and has an average depth of 5 ft. How many cubic ft. of water will it hold?
   a 160 b 400 c 800 d 4,000 —— 6

7. When the scale on a map is "⅛ in. = 10 mi." how many miles apart are two cities that are represented on a map as being 3 inches apart?
   a 24 b 240 c 120 d 80 —— 7

8. Mary, Jane, and Ruth together received $20.00. Mary received $4; Jane received $6; and Ruth received $10. What per cent of the $20.00 did Jane receive?
   a 20% b 30% c 50% d 10% —— 8

9. Elmer earned $30.00 and saved $6.00 of it. What per cent did he save?
   a 5% b ⅕% c 18% d 20% —— 9

10. A man received seven per cent interest on a loan of $1,000 for one year. How much interest did he receive?
    a $70.00 b $7.00 c $1,070 d $7,000 —— 10

11. Our team won 40 per cent of the games played, but had lost 12 games. How many games had they played altogether?
    a 15 b 52 c 60 d 20 —— 11

12. Some families spend their incomes according to carefully worked out budget plans, two of which are given below. Using these plans as a basis, how much would a family with a monthly income of $125 spend for clothing?

	$125 monthly income	$175 monthly income
Shelter	20%	17%
Food	26	25
Clothing	15	15
Operation	6	7
Savings	13	16
Other Expenses	20	20
	100%	100%

    Amount spent for clothing:
    a $18.55 b $18.75 c $27.75 d $26.25 —— 12

13. A merchant sold hats for $4.00 which cost him $3.00 each. Thus he received a gross profit of $1.00, or 25%. By what per cent was the cost price increased to provide for this 25% profit on the selling price?
    a 20% b 30% c 33⅓% d 25% —— 13

14. A building valued at $6,000 was insured for 75% of its value. The rate of insurance was 25 cents per $100. What was the amount of the premium?
    a $45.00 b $450.00 c $11.25
    d $1,125.00 —— 14

15. Helen's father owns a hardware store. He wished to purchase a dining room set at a list price of $100. One wholesale dealer offered a discount of 30% and another offered a discount of 25% and 10%. How much more will Helen's father save by taking the better discount?
    a $2.50 b $7.50 c $67.50 d $30.00 —— 15

Sec. D. Score (number right).....

TEST 4. SEC. E

These are problems in **addition**. Write your answers under the problems and also on the lines to the right.

(1)
$$\begin{array}{r} 306 \\ +570 \end{array}$$ _____ 1

(2)
$$\begin{array}{r} 47 \\ +28 \end{array}$$ _____ 2

(3)
$$\begin{array}{r} 9365 \\ 1473 \\ 2842 \\ +3105 \end{array}$$ _____ 3

(4)
$$\begin{array}{r} \$84.33 \\ 8.72 \\ 25.99 \\ +\ 6.01 \end{array}$$ _____ 4

(5) 3 da. 9 hr. 45 min.
+1 da. 16 hr. 25 min.
_____ 5

(6) $\$40.00 + \$.30 + \$6 + \$1.30 =$ _____ 6

(7)
$$\begin{array}{r} 1/4 \\ +1/4 \end{array}$$ _____ 7

(8)
$$\begin{array}{r} 1/4 \\ +1/8 \end{array}$$ _____ 8

(9)
$$\begin{array}{r} 26 \\ +\ 3\ 2/3 \end{array}$$ _____ 9

(10)
$$\begin{array}{r} 1/3 \\ +5\ 1/6 \end{array}$$ _____ 10

(11)
$$\begin{array}{r} 21\ 1/4 \\ +\ 3\ 2/5 \end{array}$$ _____ 11

(12)
$$\begin{array}{r} 7\ 1/3 \\ +4\ 7/8 \end{array}$$ _____ 12

(13)
$$\begin{array}{r} 82\ 2/3 \\ 21\ 3/4 \\ +46\ 1/2 \end{array}$$ _____ 13

(14) $6\frac{1}{2} + 4.5 =$ _____ 14

(15) $14\frac{3}{8} + 12.15 =$ _____ 15

(16) $.07 + .243 + .3149 =$ _____ 16

(17) $53.2 + 7.29 + .0621 + 5 =$ _____ 17

(18) 10% of 50 + 20% of 40 = _____ 18

(19) $2x + 3x + 4x =$ _____ 19

(20) $3(2a^2 - a) + a^2 + 5a =$ _____ 20

Sec. E. Score (number right)_____

TEST 4. SEC. F

These are problems in **subtraction**. Write your answers under the problems and also on the lines to the right.

(1)
$$\begin{array}{r} 675 \\ -403 \end{array}$$ _____ 1

(2)
$$\begin{array}{r} 72 \\ -19 \end{array}$$ _____ 2

(3)
$$\begin{array}{r} 9605 \\ -4847 \end{array}$$ _____ 3

(4)
$$\begin{array}{r} \$18.45 \\ -\ 3.65 \end{array}$$ _____ 4

(5)
$$\begin{array}{r} \$3000.00 \\ -\ 16.75 \end{array}$$ _____ 5

(6) 5 yd. 1 ft. 7 in.
−3 yd. 2 ft. 9 in.
_____ 6

(7)
$$\begin{array}{r} 1/2 \\ -1/2 \end{array}$$ _____ 7

(8)
$$\begin{array}{r} 3/5 \\ -1/5 \end{array}$$ _____ 8

(9)
$$\begin{array}{r} 1/4 \\ -1/8 \end{array}$$ _____ 9

(10)
$$\begin{array}{r} 3/4 \\ -1/3 \end{array}$$ _____ 10

(11)
$$\begin{array}{r} 8\ 2/9 \\ -4 \end{array}$$ _____ 11

(12)
$$\begin{array}{r} 8 \\ -2\ 3/4 \end{array}$$ _____ 12

(13)
$$\begin{array}{r} 56\ 1/5 \\ -23\ 4/5 \end{array}$$ _____ 13

(14) $42.50 - 6\frac{1}{4} =$ _____ 14

(15) $85\frac{2}{5} - 24.23 =$ _____ 15

(16) $36.370 - 14.27 =$ _____ 16

(17) $67.58 - 5.3394 =$ _____ 17

(18) $\frac{1}{5}$ of 40 − $\frac{1}{4}$ of 12 = _____ 18

(19) $5x - x - 3x =$ _____ 19

(20) $6a^3 - (a^3 + 2a) - 5a =$ _____ 20

Sec. F. Score (number right)_____

TEST 4. SEC. G

These are problems in **multiplication**. Write your answers under the problems and also on the lines to the right.

(1)
$$\begin{array}{r} 532 \\ \times\ \ 6 \\ \hline \end{array}$$ _____ 1

(2)
$$\begin{array}{r} 406 \\ \times\ \ 7 \\ \hline \end{array}$$ _____ 2

(3)
$$\begin{array}{r} 481 \\ \times\ 27 \\ \hline \end{array}$$ _____ 3

(4)
$$\begin{array}{r} 976 \\ \times\ 40 \\ \hline \end{array}$$ _____ 4

(5)
$$\begin{array}{r} 2034 \\ \times\ 508 \\ \hline \end{array}$$ _____ 5

(6) 3 yd. 2 ft. 2 in. $\times 8$ _____ 6

(7) $4 \times \frac{1}{4} =$ _____ 7

(8) $\frac{1}{3} \times \frac{1}{3} =$ _____ 8

(9) $\frac{1}{2} \times \frac{2}{9} =$ _____ 9

(10) $\frac{3}{4} \times \frac{8}{9} =$ _____ 10

(11) $8 \times 4\frac{1}{2} =$ _____ 11

(12) $7\frac{1}{3} \times \frac{4}{5} =$ _____ 12

(13) $6\frac{3}{7} \times 3\frac{1}{9} =$ _____ 13

(14)
$$\begin{array}{r} 5\ 3\frac{3}{4} \\ \times 12 \\ \hline \end{array}$$ _____ 14

(15)
$$\begin{array}{r} 32.95 \\ \times\ \ 3\frac{1}{5} \\ \hline \end{array}$$ _____ 15

(16)
$$\begin{array}{r} 683.7 \\ \times\ \ 4 \\ \hline \end{array}$$ _____ 16

(17)
$$\begin{array}{r} 46.27 \\ \times\ .046 \\ \hline \end{array}$$ _____ 17

(18) $5 \times 30\%$ of $20 =$ _____ 18

(19) $3x \times 4x =$ _____ 19

(20) $(a - b)(a - b^2) =$ _____ 20

Sec. G. Score (number right) .....

TEST 4. SEC. H

These are problems in **division**. Write your answers over the problems and also on the lines to the right.

(1) $6\overline{)60}$ _____ 1

(2) $4\overline{)424}$ _____ 2

(3) $33\overline{)13464}$ _____ 3

(4) $200\overline{)8000}$ _____ 4

(5) $63\overline{)5674}$ _____ 5

(6) $1 \div \frac{1}{3} =$ _____ 6

(7) $\frac{1}{4} \div 4 =$ _____ 7

(8) $8 \div \frac{4}{5} =$ _____ 8

(9) $\frac{1}{2} \div \frac{1}{2} =$ _____ 9

(10) $\frac{5}{8} \div \frac{1}{4} =$ _____ 10

(11) $5\frac{1}{3} \div \frac{3}{4} =$ _____ 11

(12) $6\frac{3}{5} \div 3\frac{1}{8} =$ _____ 12

(13) $80 \div 2\frac{1}{2} =$ _____ 13

(14) $5\overline{)127\frac{1}{3}}$ _____ 14

(15) $.03\overline{)9}$ _____ 15

(16) $2\overline{)7.12}$ _____ 16

(17) $.02\overline{).712}$ _____ 17

(18) $\frac{1}{3}$ of $27 \div \frac{1}{6}$ of $18 =$ _____ 18

(19) $\dfrac{x^2 - x}{x} =$ _____ 19

(20) $\dfrac{4a^3 - 4a^2b + ab - b^2}{a - b} =$ _____ 20

Sec. H. Score (number right) .....

Date Due

NOV 2 1954			
NOV 17 1954		JAN 7 1957	
		JAN 21 1957	
NOV 24 1954			
DEC 7 1954		MAY 1 - 1957	
MAR 2 1955		MAY 19 1958	
MAR 1955		NOV 3 1960	
MAR 16 1955		MAY 19 '84	
APR 28 1955			
APR 1955			
JUL 19 1956			
AUG 1956			
OCT 8 1956			

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